

MEMORANDUM

TO: Evan Osborne, U.S. EPA, Underground Injection Control, Region 10
FROM: Cascadia Law Group and Yale Carbon Containment Lab
DATE: April 6, 2022
RE: Pilot Project for Sequestering CO₂ in the Columbia River Basalt Group – Regulatory Issues

As you may recall, the Yale Carbon Containment Lab (YCCL) has developed a proposal to permanently sequester supercritical carbon dioxide (scCO₂) deep in the Columbia River Basalt Group (CRBG). YCCL has conducted over a year of scoping and analysis, and its next operational phases involve drilling several characterization wells to better assess underground geologic formations in the CRBG and subsequently injecting scCO₂ into a series of pilot test wells to determine the CRBG's potential for large-scale sequestration. This memo describes these two phases (collectively, "Pilot Project") and provides a preliminary assessment of associated regulatory issues. It also provides updated information about the Pilot Project since the U.S. Environmental Protection Agency (EPA), Underground Injection Control (UIC) Program and YCCL last met in December 2021.

I. DESCRIPTION OF THE PILOT PROJECT

The CRBG is an igneous province with an average vertical thickness of 1 km. YCCL proposes to inject scCO₂ into the CRBG, where the CO₂ will react with the magnesium, calcium, and iron in the basalt to form carbonate minerals within the basalt's pore space, permanently storing CO₂. A previous small-scale pilot test near Wallula, WA, conducted by the Pacific Northwest National Laboratory (PNNL), determined that rapid carbon mineralization will occur. Of the 977 metric tons (MT) of scCO₂ that PNNL injected, 60% was mineralized within two years. YCCL anticipates its Pilot Project will validate PNNL's preliminary work. YCCL estimates the CRBG has a potential useable storage capacity of billions of MT CO₂.

YCCL is evaluating several potential well sites in WA. Initially, characterization wells will be drilled to better understand the specific geologic characteristics of the site(s). No scCO₂ will be injected into the characterization wells. If results confirm the presence of basalt formations suitable for injection, pilot test injection well(s) will be drilled to a depth of 800 to 1500 meters to ensure sufficiently high pressure and temperature to use scCO₂ and ensure mineralization. YCCL plans to install one to four pilot test injection wells (funding dependent) and to inject 10,000–50,000 MT scCO₂ per well annually for 1 to 2 years.

Injection will be limited to formations with favorable storage characteristics, including being bounded by both stratigraphic and structural trapping elements to confine movement to a defined area, as well as formations that are deeper than any freshwater aquifers and separated from such aquifers by confining strata. The pilot test injection wells will be located at least 1 km from fault lines, dikes, and other potential areas of geologic complexity—yet near accessible regions where sources of CO₂ could be gathered. Results will be carefully monitored, and the data generated will enable YCCL to calculate rates of scCO₂ injection and mineralization across the CRBG and to refine YCCL's estimate of the CRBG's maximum useable storage capacity. The Pilot Project will also more broadly confirm the CRBG's suitability for carbon storage and will inform siting decisions for future larger-scale commercial sequestration operations.

II. REGULATORY ISSUES

Our preliminary analysis indicates implementing the Pilot Project will require compliance with the following federal and state laws. YCCL intends to work closely with EPA and the WA Department of Ecology to ensure regulatory compliance.

Safe Drinking Water Act (SDWA): After the last meeting between YCCL and EPA, YCCL researched whether classifying the pilot test well(s) as Class V experimental technology wells rather than as Class VI wells may be appropriate. We believe it is, and, as such, anticipate Ecology will be the permitting authority.

In 2007, EPA issued guidance allowing experimental technology wells for the geologic sequestration (GS) of CO₂ to be permitted as Class V wells. See U.S. EPA, *UIC Program Guidance #83: Using the Class V Experimental Technology Well Classification for Pilot Geologic Sequestration* (Mar. 1, 2007). In 2010, EPA established the category of Class VI wells. See generally 75 Fed. Reg. 77291 (Dec. 10, 2010); see also 40 C.F.R. Part 146. In so doing, EPA explained that “GS projects of an experimental nature (*i.e.*, to test GS technologies and collect data) will continue to be classified, permitted, and regulated as Class V experimental technology wells[.]” 75 Fed. Reg. 77291, 77245.

Class V experimental technology wells utilize technology that “has not been proven feasible under the conditions in which it is being tested.” 40 C.F.R. § 146.3; see also 40 C.F.R. § 146.5(e)(15). All other GS injection wells, including those testing “the injectivity or appropriateness of an individual formation (*e.g.*, as a prelude to a commercial-scale operation),” should be permitted as a Class VI well. 75 Fed. Reg. 77291, 77245; see also 40 C.F.R. § 146.5(f) (explaining Class VI wells “are not experimental in nature”).

The purpose of the pilot test injection well(s) is to determine the suitability of the CRBG for larger-scale sequestration of scCO₂. YCCL knows of no effort worldwide to sequester scCO₂ in basalt other than PNNL’s preliminary test, which injected less than 1,000 MT of CO₂. To ensure the safety of people and the environment, YCCL needs to test this technology. By injecting more scCO₂ into the CRBG at well sites across the CRBG, YCCL will be able to calculate rates of scCO₂ injection and mineralization, determine the CRBG’s maximum useable storage capacity, and gather additional data to inform future siting decisions before proceeding with larger-scale sequestration. If the Pilot Project is successful, YCCL would petition EPA for a Class VI permit for any wells that YCCL operates commercially.

In the meantime, WA has primacy for Class V wells, which it defines to include “wells used to inject [CO₂] for [GS].” See WAC 173-218-040(5)(a)(xv). YCCL has met with Ecology about permitting the pilot well(s). Ecology staff know we are meeting with you, and we understand that they will be asking for time with you and others at EPA to discuss the UIC regulatory issues raised here.

Clean Air Act (CAA): As a research and development project “that will enable safe and effective long-term containment of a CO₂ stream in subsurface geologic formations,” the Pilot Project is exempt from the CAA’s reporting requirements so long as an exemption application is submitted within 180 days of receipt of a UIC permit. 40 C.F.R. § 98.449. Similarly, we have confirmed with Ecology that WA’s rule requiring certain obligated parties to report emissions of greenhouse gases, Chapter 173-441 WAC, does not apply to YCCL.

National Environmental Policy Act (NEPA)/State Environmental Policy Act (SEPA): YCCL will comply with NEPA and its state-law counterpart, SEPA, to the extent either or both apply. After a preliminary review, we have concluded that environmental review under NEPA may not be required. This is so because YCCL does not plan to locate the pilot test injection well(s) on federal land, Department of Energy funding decisions are categorically exempt from NEPA so long as less than 500,000 tons of CO₂ in the aggregate is injected, and EPA has determined that the UIC program is exempt from NEPA under a functional equivalence analysis. See 10 C.F.R. § 1021.410(b); Fed. Reg. 77229, 77236 (Dec. 10, 2010) (citing *Western Nebraska Resources Council v. U.S. EPA*, 943 F.2d 867, 871–72 (8th Cir. 1991) and EPA Associate General Counsel Opinion (August 20, 1979)). SEPA, on the other hand, likely will apply.

National Historic Preservation Act (NHPA): The NHPA requires any agency aiding or approving a project to comply with Section 106 of the NHPA, 36 C.F.R. Part 800, by considering the effects of the proposed project on historic properties or archeological or cultural resources. The NHPA will apply if federal funding or permits are issued or if federal land is used. YCCL hopes to receive federal funding.

Tribal Consultation: YCCL introduced the Carbon TrapRock Project concept to members of the Yakama Nation in June 2021 and will work closely with it and other interested Tribes to identify and mitigate any potential impacts to tribal treaty rights, including potential impacts to cultural resources.

We look forward to collaborating with the EPA to realize the future of carbon capture and sequestration. Thank you for your continued responsiveness and guidance.